

Mad, ilt, motion og mentalfunktion • Næring og energi mod ADHD

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Unlimited Possibilities



Basal metabolism

60% fedt i tørvægt
20-25% muskler og blod

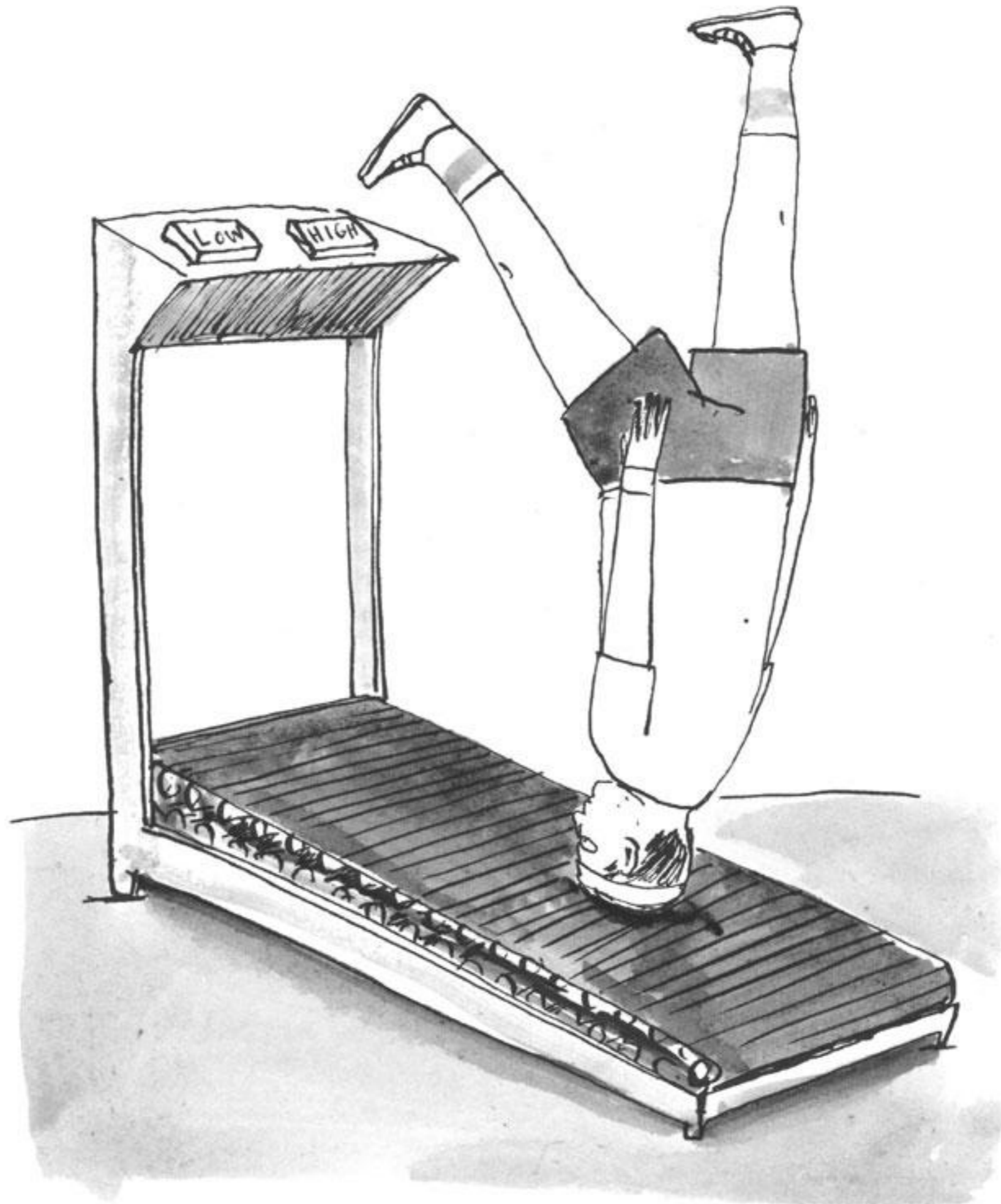
- Der er en stor variation i basal metabolisme
- De fleste er ordentlig aktive
- Det er også meget krævende i vad
- vitaminer, mineraler, sporstoffer og



Hjernens behov







Deep Blue



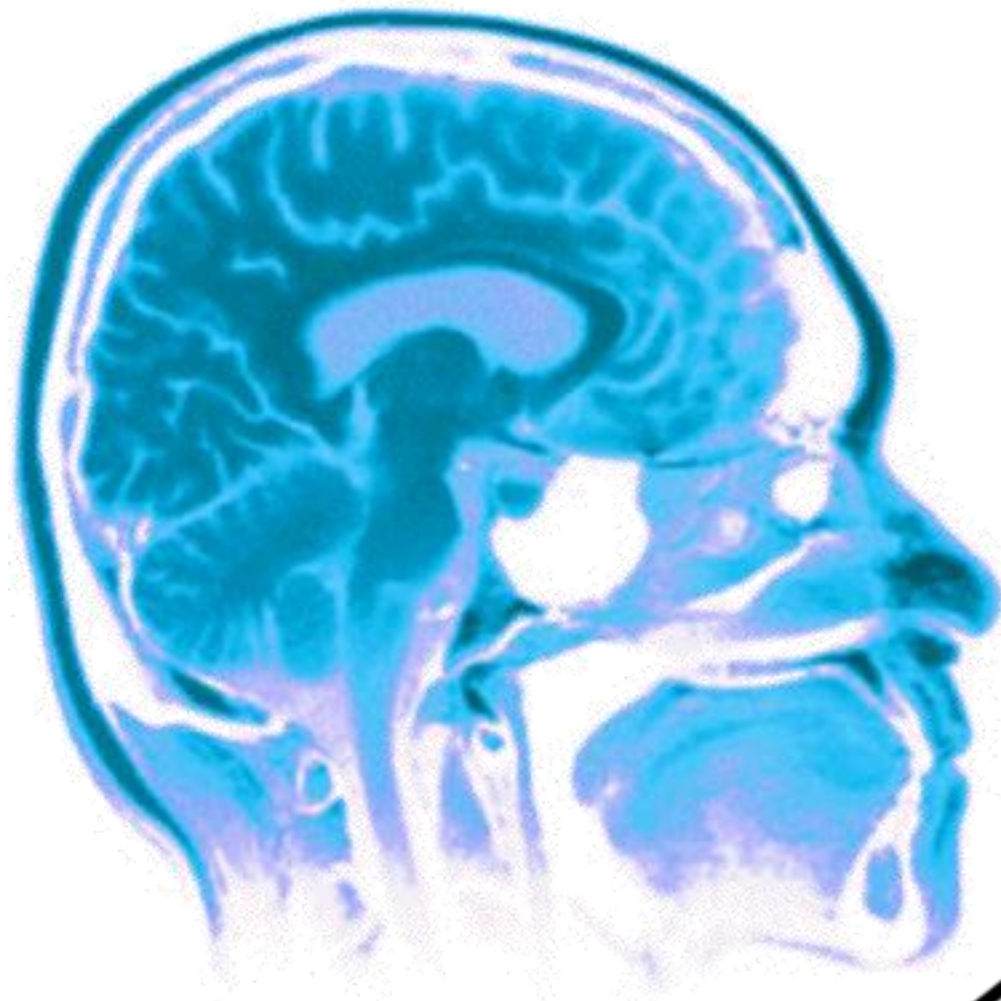
**Deep Blue: 3 million
MIPS i computer power**

**3.000.000 instruktioner
per sekund**

**Menneskehjernen: 100
million MIPS i computer
power**

**100.000.000
instruktioner per
sekund!**

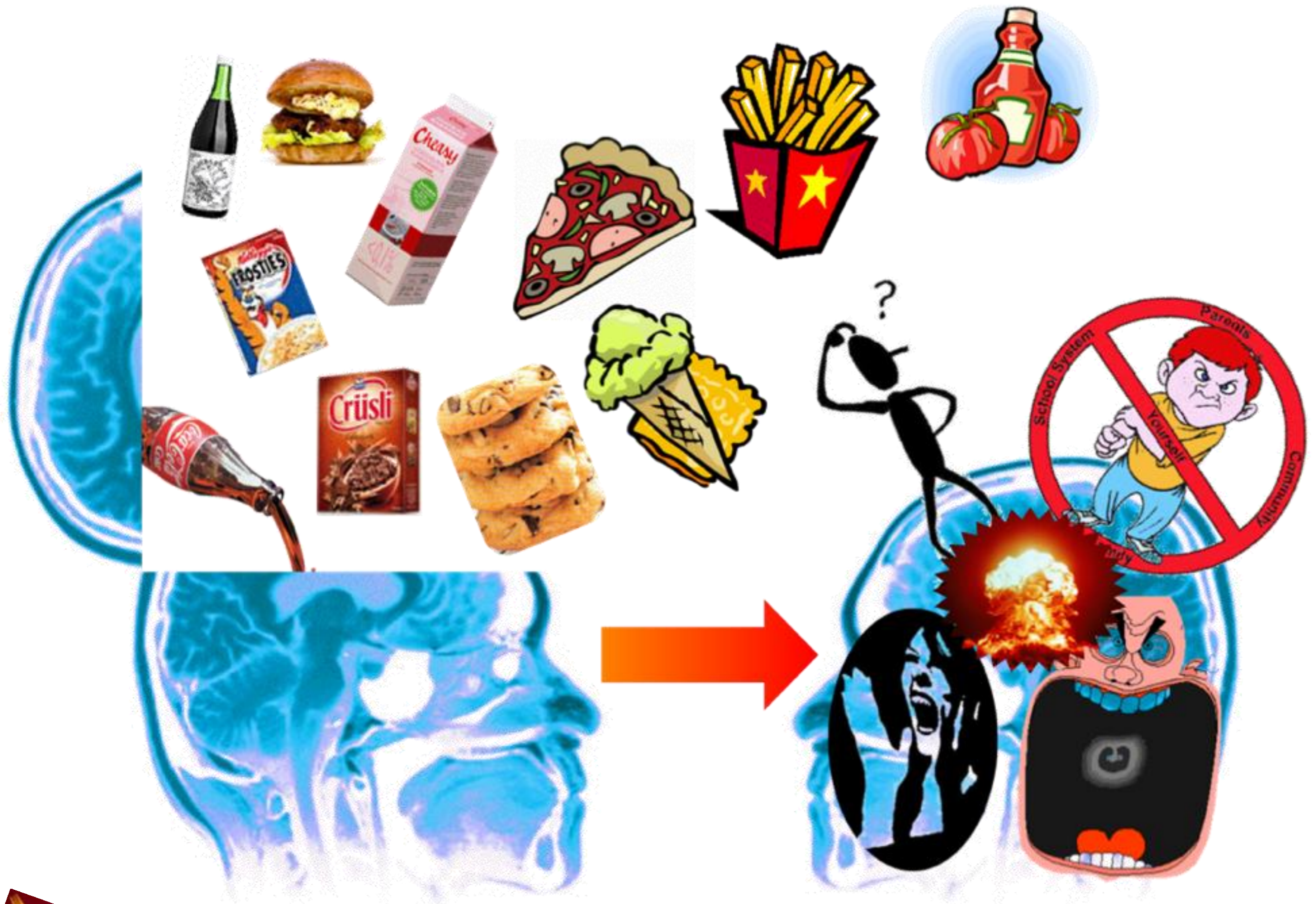


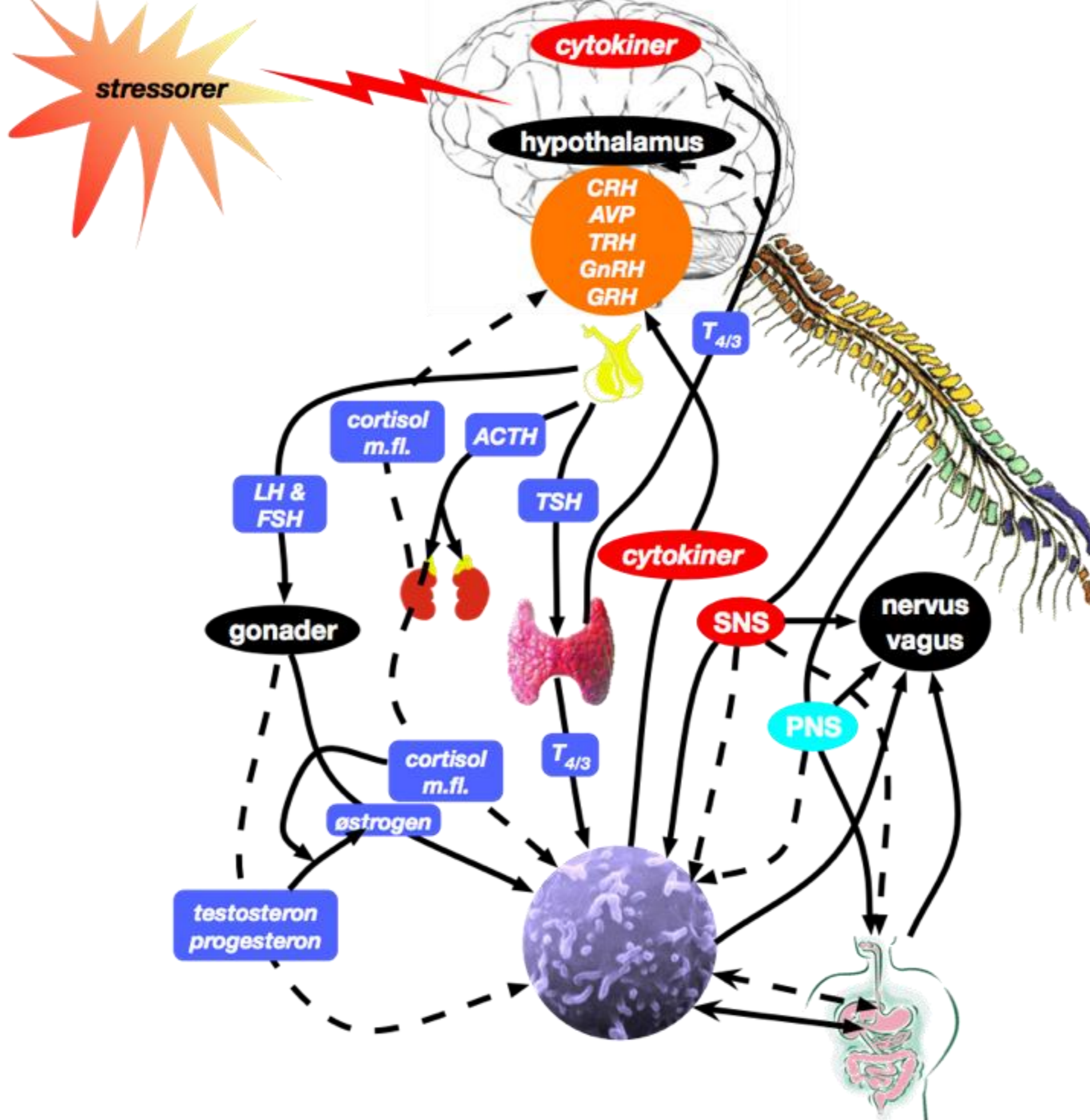


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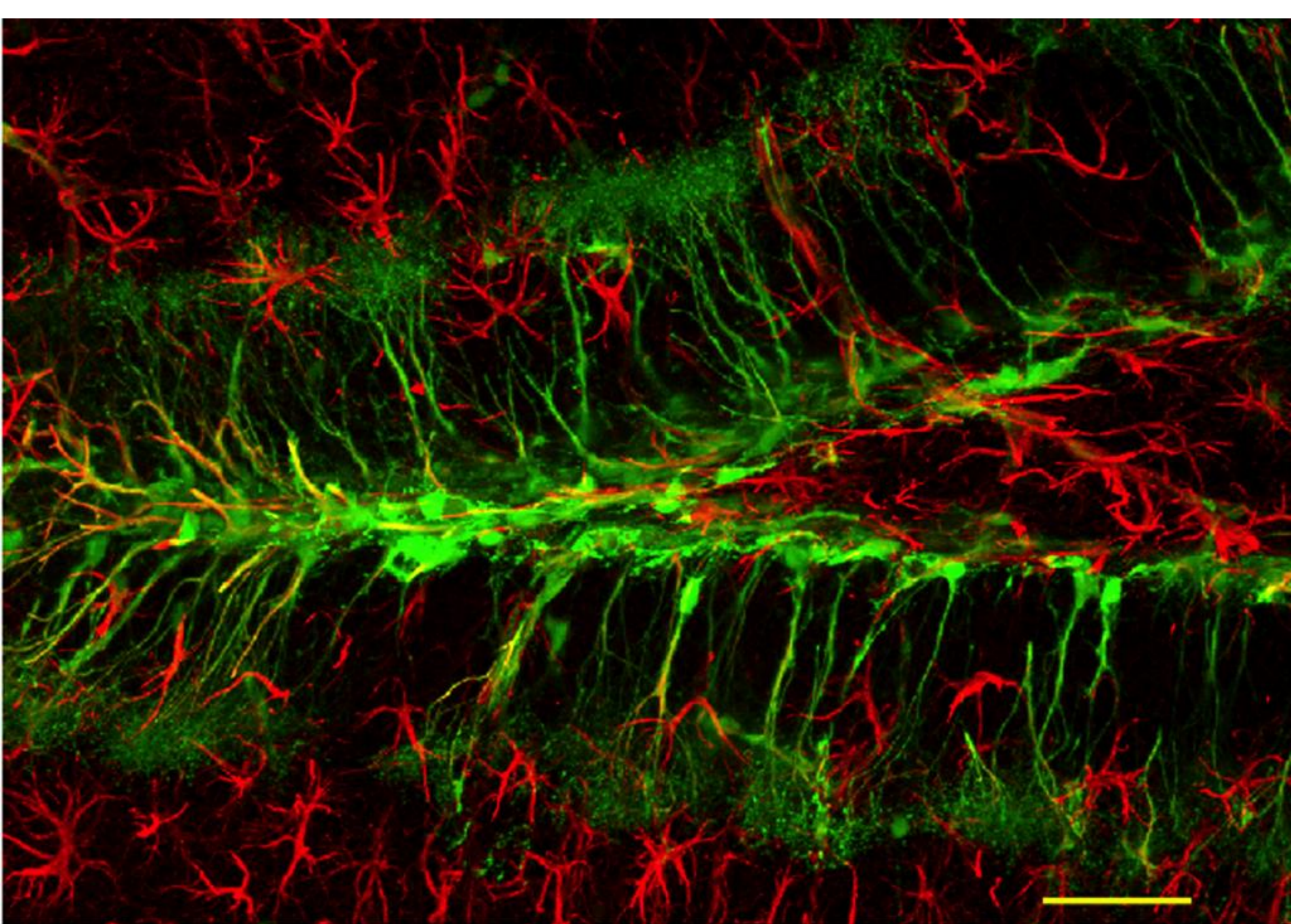


Neuroplasticitet



Hjernen er “formbar”





Blinde kan se med tungen!



Forskningsresultater



Influences of micronutrient and omega-3 fatty acid supplementation on cognition, learning, and behavior: methodological considerations and implications for children and adolescents in developed societies

Forskning antyder at børn i industrisamfund scorer højere på tests af ikke-verbal intelligens og har forbedret adfærd, efter de har fået vitamin- og mineraltilskud med eller uden omega-3 fedtsyrer (fiskeolie), sammenlignet. Størst effekt blev set i forsøg der varede i mere end 3 måneder og i undergrupper af børn med lav socio-økonomisk status, tegn på ADHD og/eller indlæringsproblemer...

- Frensham LJ, Bryan J, Parletta N. (2012) *Nutr Rev.* 70(10): 594-610





Kostens betydning i behandlingen af ADHD hos børn

En systematisk gennemgang af litteraturen

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Maren Johanne Heilskov Rytter
Tine Houmann
Niels Bilenberg
Allan Hvolby
Lotte Lauritzen
Christian Mølgaard
Kim Fleischer Michaelsen

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April 2012



KU

- Nylig gennemgang af forskningen i sammenhængen mellem kost og ADHD
- Positive trends
 - Eliminationsdiæt
 - Sund mad
 - Omega-3 fedtsyrer
 - Zink og jern ved mangel/utilstrækkelighed
 - *ScanBrit også omtalt*



Omega-3 Fatty Acid Supplementation for the Treatment of Children With Attention-Deficit/Hyperactivity Disorder Symptomatology: Systematic Review and Meta-Analysis

- Several studies have demonstrated differences in omega-3 fatty acid composition in plasma and in erythrocyte membranes in patients with attention-deficit/hyperactivity disorder (ADHD) compared with unaffected controls. Omega-3 fatty acids have anti-inflammatory properties and can alter central nervous system cell membrane fluidity and phospholipid composition. Cell membrane fluidity can alter serotonin and dopamine neurotransmission. The goal of this meta-analysis was to examine the efficacy of omega-3 fatty acid supplementation in children with ADHD.
- Ten trials involving 699 children were included in this meta-analysis. Omega-3 fatty acid supplementation demonstrated a small but significant effect in improving ADHD symptoms. Eicosapentaenoic acid dose within supplements was significantly correlated with supplement efficacy. No evidence of publication bias or heterogeneity between trials was found.
- Conclusion: Omega-3 fatty acid supplementation, particularly with higher doses of eicosapentaenoic acid, was modestly effective in the treatment of ADHD. The relative efficacy of omega-3 fatty acid supplementation was modest compared with currently available pharmacotherapies for ADHD such as psychostimulants, atomoxetine, or $\alpha 2$ agonists. However, given its relatively benign side-effect profile and evidence of modest efficacy, it may be reasonable to use omega-3 fatty supplementation to augment traditional pharmacologic interventions or for families who decline other psychopharmacologic options.
- Bloch MH, Qawasmi A (2011) *Journal of the American Academy of Child & Adolescent Psychiatry* 16 August EPub ahead of print



The ScanBrit randomised, controlled, single-blind study of a gluten- and casein-free dietary intervention for children with autism spectrum disorders

- There is increasing interest in the use of gluten- and casein-free diets for children with autism spectrum disorders (ASDs). We report results from a two-stage, 24-month, randomised, controlled trial incorporating an adaptive 'catch-up' design and interim analysis.
- Stage 1 of the trial saw 72 Danish children (aged 4 years to 10 years 11 months) assigned to diet (A) or non-diet (B) groups by stratified randomisation. Autism Diagnostic Observation Schedule (ADOS) and the Gilliam Autism Rating Scale (GARS) were used to assess core autism behaviours, Vineland Adaptive Behaviour Scales (VABS) to ascertain developmental level, and Attention-Deficit Hyperactivity Disorder - IV scale (ADHD-IV) to determine inattention and hyperactivity.
- Participants were tested at baseline, 8, and 12 months. Based on per protocol repeated measures analysis, data for 26 diet children and 29 controls were available at 12 months. At this point, there was a significant improvement to mean diet group scores (time*treatment interaction) on sub-domains of ADOS, GARS and ADHD-IV measures.
- Surpassing of predefined statistical thresholds as evidence of improvement in group A at 12 months sanctioned the re-assignment of group B participants to active dietary treatment. Stage 2 data for 18 group A and 17 group B participants were available at 24 months. Multiple scenario analysis based on inter- and intra-group comparisons showed some evidence of sustained clinical group improvements although possibly indicative of a plateau effect for intervention.
- Our results suggest that dietary intervention may positively affect developmental outcome for some children diagnosed with ASD. In the absence of a placebo condition to the current investigation, we are, however, unable to disqualify potential effects derived from intervention outside of dietary changes.
- Whiteley P, Haracopos D, Knivsberg AM, Reichelt KL, Parlar S, Jacobsen J, Seim A, Pedersen L, Schondel M, Shattock P. (2010) *Nutr Neurosci*. 13(2): 87-100.



Alterations of the intestinal barrier in patients with autism spectrum disorders and in their first-degree relatives

- **OBJECTIVES:** Intestinal permeability (IPT) was investigated in patients with autism as well as in their first-degree relatives to investigate leaky gut hypothesis. Faecal calprotectin (FC) was also measured in patients with autism, either with or without gastrointestinal symptoms, and in their first-degree relatives.
- **PATIENTS AND METHODS:** IPT results, assessed by means of the lactulose/mannitol test, were compared with adult and child controls and with FC values.
- **RESULTS:** A high percentage of abnormal IPT values were found among patients with autism (36.7%) and their relatives (21.2%) compared with normal subjects (4.8%). Patients with autism on a reported gluten-casein-free diet had significantly lower IPT values compared with those who were on an unrestricted diet and controls. Gastrointestinal symptoms were present in 46.7% of children with autism: constipation (45.5%), diarrhoea (34.1%), and others (alternating diarrhoea/constipation, abdominal pain, etc: 15.9%). FC was elevated in 24.4% of patients with autism and in 11.6% of their relatives; it was not, however, correlated with abnormal IPT values.
- **CONCLUSIONS:** The results obtained support the leaky gut hypothesis and indicate that measuring IPT could help to identify a subgroup of patients with autism who could benefit from a gluten-free diet. The IPT alterations found in first-degree relatives suggest the presence of an intestinal (tight-junction linked) hereditary factor in the families of subjects with autism.
- de Magistris L, Familiari V, Pascotto A, Sapone A, Frolli A, Iardino P, Carteni M, De Rosa M, Francavilla R, Riegler G, Militerni R, Bravaccio C. (2010) J Pediatr Gastroenterol Nutr. 2010 Oct;51(4):418-24.



Effects of a restricted elimination diet on the behaviour of children with attention-deficit hyperactivity disorder (INCA study): a randomised controlled trial

- The effects of a restricted elimination diet in children with attention-deficit hyperactivity disorder (ADHD) have mainly been investigated in selected subgroups of patients. We aimed to investigate whether there is a connection between diet and behaviour in an unselected group of children.
- The Impact of Nutrition on Children with ADHD (INCA) study was a randomised controlled trial that consisted of an open-label phase with masked measurements followed by a double-blind crossover phase....In the open-label phase (first phase), children aged 4—8 years who were diagnosed with ADHD were randomly assigned to 5 weeks of a restricted elimination diet (diet group) or to instructions for a healthy diet (control group). Thereafter, the clinical responders (those with an improvement of at least 40% on the ADHD rating scale [ARS]) from the diet group proceeded with a 4-week double-blind crossover food challenge phase (second phase). During the first phase, only the assessing paediatrician was masked to group allocation. During the second phase (challenge phase), all persons involved were masked to challenge allocation. Primary endpoints were the change in ARS score between baseline and the end of the first phase (masked paediatrician) and between the end of the first phase and the second phase (double-blind), and the abbreviated Conners' scale (ACS) score (unmasked) between the same timepoints. The primary analyses were intention to treat for the first phase and per protocol for the second phase.
- 100 children were enrolled and randomly assigned to the control group (n=50) or the diet group (n=50). Between baseline and the end of the first phase, the difference between the diet group and the control group in the mean ARS total score was 23.7 (95% CI 18.6—28.8; $p < 0.0001$) according to the masked ratings. The difference between groups in the mean ACS score between the same timepoints was 11.8 (95% CI 9.2—14.5; $p < 0.0001$). The ARS total score increased in clinical responders after the challenge by 20.8 (95% CI 14.3—27.3; $p < 0.0001$) and the ACS score increased by 11.6 (7.7—15.4; $p < 0.0001$). In the challenge phase, after challenges...relapse of ADHD symptoms occurred in 19 of 30 (63%) children.... There were no harms or adverse events reported...
- A strictly supervised restricted elimination diet is a valuable instrument to assess whether ADHD is induced by food.
- Lidy M Peiser et al. *The Lancet*, Volume 377, Issue 9764, Pages 494 - 503, 5 February 2011



Effects of a few food diet in attention deficit disorder

- Seventyeight children, referred to a diet clinic because of hyperactive behaviour, were placed on a 'fewfoods' elimination diet. Fifty nine improved in behaviour during this open trial. For 19 of these children it was possible to disguise foods or additives, or both, that reliably provoked behavioural problems by mixing them with other tolerated foods and to test their effect in a placebo-controlled double blind challenge protocol. The results of a crossover trial on these 19 children showed a significant effect for the provoking foods to worsen ratings of behaviour and to impair psychological test performance. This study shows that observations of change in behaviour associated with diet made by parents and other people with a role in the child's care can be reproduced using double-blind methodology and objective assessments.
- Clinicians should give weight to the accounts of parents and consider this treatment in selected children with a suggestive medical history.
- CM Carter et al. *Archives of Disease in Childhood* 1993; 69: 564-568



The Role of Histamine Degradation Gene Polymorphisms in Moderating the Effects of Food Additives on Children's ADHD Symptoms

- Food additives can exacerbate ADHD symptoms and cause non-immunoglobulin E-dependent histamine release...However, children vary in the extent to which their ADHD symptoms are exacerbated by the ingestion of food additives. The authors hypothesized that genetic polymorphisms affecting histamine degradation would explain the diversity of responses to additives. **METHOD:** In a double-blind, placebo-controlled crossover trial, challenges involving two food color additive and sodium benzoate (preservative) mixtures in a fruit drink were administered to a general community sample of 3-year-old children (N=153) and 8/9-year-old children (N=144). An aggregate ADHD symptom measure (based on teacher and parent blind ratings of behavior, blind direct observation of behavior in the classroom, and—for 8/9-year-old children only—a computerized measure of attention) was the main outcome variable. **RESULTS:** The adverse effect of food additives on ADHD symptoms was moderated by histamine degradation gene polymorphisms HNMT T939C and HNMT Thr105Ile in 3- and 8/9-year-old children and by a DAT1 polymorphism (short versus long) in 8/9-year-old children only...**CONCLUSIONS:** Histamine may mediate the effects of food additives on ADHD symptoms, and variations in genes influencing the action of histamine may explain the inconsistency between previous studies. Genes influencing a range of neurotransmitter systems and their interplay with environmental factors, such as diet, need to be examined to understand genetic influences on ADHD symptoms.



Differences between the gut microflora of children with autistic spectrum disorders and that of healthy children

- Abstract: Children with autistic spectrum disorders (ASDs) tend to suffer from severe gastrointestinal problems. Such symptoms may be due to a disruption of the indigenous gut flora promoting the overgrowth of potentially pathogenic micro-organisms. The faecal flora of patients with ASDs was studied and compared with those of two control groups (healthy siblings and unrelated healthy children). Faecal bacterial populations were assessed through the use of a culture-independent technique, fluorescence in situ hybridization, using oligonucleotide probes targeting predominant components of the gut flora. The faecal flora of ASD patients contained a higher incidence of the *Clostridium histolyticum* group (*Clostridium* clusters I and II) of bacteria than that of healthy children. However, the non-autistic sibling group had an intermediate level of the *C. histolyticum* group, which was not significantly different from either of the other subject groups. Members of the *C. histolyticum* group are recognized toxin-producers and may contribute towards gut dysfunction, with their metabolic products also exerting systemic effects. Strategies to reduce clostridial population levels harboured by ASD patients or to improve their gut microflora profile through dietary modulation may help to alleviate gut disorders common in such patients
- Helena MRT Parracho, Max O Bingham, Glenn R Gibson and Anne L McCartney



Gastrointestinal Microflora

Studies in Late-Onset Autism

- Some cases of late-onset (regressive) autism may involve abnormal flora because oral vancomycin, which is poorly absorbed, may lead to significant improvement in these children. Fecal flora of children with regressive autism was compared with that of control children, and clostridial counts were higher. The number of clostridial species found in the stools of children with autism was greater than in the stools of control children. Children with autism had 9 species of *Clostridium* not found in controls, whereas controls yielded only 3 species not found in children with autism. In all, there were 25 different clostridial species found. In gastric and duodenal specimens, the most striking finding was total absence of non—spore-forming anaerobes and microaerophilic bacteria from control children and significant numbers of such bacteria from children with autism. These studies demonstrate significant alterations in the upper and lower intestinal flora of children with late-onset autism and may provide insights into the nature of this disorder.

- Sidney Finegold et. al.



Desulfovibrio species are potentially important in regressive autism

- Autism is a complex disorder with no specific diagnostic test so the disease is defined by its characteristics including cognitive defects, social, communication and behavioral problems, repetitive behaviors, unusual sensitivity to stimuli such as noise, restricted interests, and self stimulation. The incidence of this disease has increased remarkably in recent years and was 110/10,000 children (~1%) in multiple areas of the US in 2007. The financial burden on families and communities is enormous. In terms of predisposing factors, heredity plays a role in some subjects, but it is clear that environmental factors are also important. Environmental toxins can affect the immune system adversely. Intestinal bacteria are recognized by a few investigators as potentially important and we have proposed that certain antimicrobial drugs may be a key factor in modifying the intestinal bacterial flora adversely, selecting out potentially harmful bacteria that are normally suppressed by an intact normal intestinal flora. We had felt that clostridia in the gut might be involved in autism because they are virulent organisms and spore-formers; spores would resist antibacterial agents so that when antibiotics were discontinued the spores would germinate and by toxin production or another mechanism lead to autism. However, a recent study of ours employing the powerful pyrosequencing technique on stools of subjects with regressive autism showed that Desulfovibrio was more common in autistic subjects than in controls. We subsequently confirmed this with pilot cultural and real-time PCR studies and found siblings of autistic children had counts of Desulfovibrio that were intermediate, suggesting possible spread of the organism in the family environment. Desulfovibrio is an anaerobic bacillus that does not produce spores but is nevertheless resistant to aerobic and other adverse conditions by other mechanisms and is commonly resistant to certain antimicrobial agents (such as cephalosporins) often used to treat ear and other infections that are relatively common in childhood. This bacterium also produces important virulence factors and its physiology and metabolism position it uniquely to account for much of the pathophysiology seen in autism. If these results on Desulfovibrio are confirmed and extended in other studies, including treatment trials with appropriate agents and careful clinical and laboratory studies, this could lead to more reliable classification of autism, a diagnostic test and therapy for regressive autism, development of a vaccine for prevention and treatment of regressive autism, tailored probiotics/prebiotics, and important epidemiologic information.

- Sidney Finegold et al. Med Hypotheses. 2011 Aug;77(2):270-4. Epub 2011 May 17.

